CLAIMS

1. A regenerative pumping mechanism comprising a rotor having a series of blades positioned in an annular array on one side of the rotor and extending axially into an annular channel of a stator within which the blades rotate, and means for actively controlling relative axial movement between the rotor and the stator so as to control the axial clearance between the rotor and the stator.

2. A mechanism according to Claim 1, wherein the means for actively controlling relative axial movement comprises an axial magnetic bearing for controlling axial movement of the rotor relative to the stator.

3. A mechanism according to Claim 2, wherein the axial magnetic bearing comprises at least one electromagnet arranged to draw the rotor towards the stator.

4. A mechanism according to Claim 3, wherein the electromagnet is mounted on the stator.

5. A mechanism according to Claim 3 or Claim 4, wherein the axial magnetic bearing comprises at least one second electromagnet arranged to draw the rotor away from the stator.

6. A mechanism according to Claim 5, wherein the axial magnetic bearing comprises a magnetic bearing rotor, the magnetic bearing rotor and the rotor of the regenerative mechanism being located on a common shaft, the magnetic bearing rotor being located between the first and second electromagnets.

7. A mechanism according to any of Claims 3 to 6, comprising control means for controlling the strength of the magnetic field generated by the electromagnet(s) and thus the axial position of the rotor relative to the stator.

8. A mechanism according to Claim 1, wherein the means for actively controlling axial movement comprises an actuator actuable to control the axial position of the rotor.

9. A mechanism according to Claim 8, wherein the actuator comprises magnetostrictive material.

10. A mechanism according to Claim 9, comprising control means for controlling the strength of a magnetic field applied to the actuator so as to control the shape of the actuator and thus the axial position of the rotor relative to the stator.

11. A mechanism according to Claim 8, comprising control means for controlling actuation of the actuator and thus control the axial position of the rotor relative to the stator.

12. A mechanism according to Claim 7 or Claim 11, wherein the control means comprises means for detecting the axial position of the rotor relative to the stator and means for controlling the means for actively controlling relative axial movement in response to the detected position.

13. A mechanism according to any preceding claim, comprising means for limiting the amount of relative movement between the rotor and the stator.

14. A mechanism according to any preceding claim, wherein at least one of the rotor and the stator is formed from, or coated with, a wear-resistant material to minimise damage in the event of contact between the rotor and the stator.

15. A mechanism according to any preceding claim, wherein the rotor has at least two series of blades positioned in concentric annular arrays on a side of the rotor and the stator has a corresponding number of channels within which the blades of the arrays can rotate and means are provided to link the channels to form a continuous passageway through which fluid can pass.

16. A mechanism according to any preceding claim, comprising a drive shaft for driving the mechanism.

17. A mechanism according to Claim 16, wherein the drive shaft is supported at each end thereof by a lubricant free bearing.

18. A mechanism according to Claim 17, wherein each lubricant free bearing comprises a magnetic bearing.

19. A mechanism according to any of Claims 16 to 18, wherein the drive shaft is additionally supported at each end by a rolling bearing.

20. A mechanism according to any of Claims 16 to 19, wherein the means for actively controlling relative axial movement is arranged to control axial movement of the drive shaft and thereby control the axial position of the rotor relative to the stator.

21. A mechanism according to Claims 19 and 20, wherein the means for actively controlling relative axial movement is arranged to axially

move a said rolling bearing to control the axial position of the drive shaft.

22. A pumping arrangement comprising a regenerative pumping mechanism according to any preceding claim.

23. A pumping arrangement according to Claim 22, comprising means for controlling the axial clearance between the rotor and the stator and so control the pressure in a chamber connected to the pumping arrangement.

24. A pumping arrangement for controlling pressure in a chamber, the arrangement comprising a regenerative pumping mechanism comprising a rotor having a series of blades positioned in an annular array on one side of the rotor, and a stator having an annular channel within which the blades rotate; and means for effecting relative axial movement between the rotor and the stator during use of the pump to control the axial clearance between the rotor and the stator and so control the pressure in the chamber.

25. An arrangement according to Claim 24, comprising a drive shaft for driving the mechanism, the means for actively controlling relative axial movement being arranged to control axial movement of the drive shaft and thereby control the axial position of the rotor relative to the stator.

26. An arrangement according to Claim 24 or Claim 25, wherein the means for effecting relative axial movement comprises an axial magnetic bearing for controlling axial movement of the rotor relative to the stator.

27. An arrangement according to Claim 24 or Claim 25, wherein the means for effecting relative axial movement comprises an actuator actuable to control the axial position of the rotor relative to the stator.

28. An arrangement according to Claims 25 and 27, wherein the actuator is arranged to move a bearing for supporting the drive shaft.